



3.5 GEOLOGY AND MINERAL RESOURCES

The area considered for the SYP, HCP, and the Headwaters Reserve lies in the Coast Range of Northern California (Figure 3.5-1). The area's mineral potential is influenced by the general geology and rock types and relief and rock type (parent material of soils) influence soil (see Section 3.6, Soils and Geomorphology). These slope and soil characteristics in turn influence a site's susceptibility to mass wasting (i.e., landslides) and soil erosion. In the Coast Range, the proximity of the proposed Headwater Reserve and the HCP/SYP planning area to three of the earth's lithospheric plates results in complex geology. Details concerning soils and mass wasting are presented in Section 3.6, while this section discusses the major components of the geology and mineral resources of the affected environment and potential environmental effects.

The geology summary presented here is based on published studies and reports. The geology of the Project Area is complex and a full review of the rock units, their characteristics, the folds and faults, and the tectonic processes of the region is beyond the scope of this EIS/EIR. This section describes the existing geologic environment for the general public and decision-maker and presents the likely effects resulting from the various alternatives. It is not a technical geologic report, nor does it substitute for the site-specific geology review required as part of the THP process, among other regulatory requirements.

Subsurface mineral estates are not always linked with the surface lands when property changes ownership. Where this

occurs, the ownership of the surface lands may not exclude the use, exploration, or exploitation of the mineral resources owned by another party. On lands owned by or conveyed to the United States or State of California, the mineral estate can be restricted from mining-related activity when these activities conflict with the surface use of the lands. The mineral estates in the Reserve are generally connected with the surface lands.

3.5.1 Affected Environment

3.5.1.1 Geology and Physiography

PALCO's lands, as well as nearby lands, occupy the geologically active portion of northern California just to the east of Mendocino Triple Junction (MTJ) where three of the earth's lithospheric plates meet (Carver, 1992). The Pacific plate, located west and south of Cape Mendocino, moves north relative to the North American plate along the San Andreas fault system. The Gorda plate is being subducted under the North American plate along the Cascadia Subduction Zone. This interaction of plates is actively creating the landscape of Humboldt County where PALCO and the Elk River Timber Company own land and where the proposed Headwater Reserve would lie.

Located in the Coast Range Province of Northern California, PALCO and adjacent lands can be divided into two distinct regions that reflect the underlying rocks and the tectonic forces that affect the area. The northern region lies between the Mad and the Eel rivers, consisting of northwest trending valleys and ridges. The

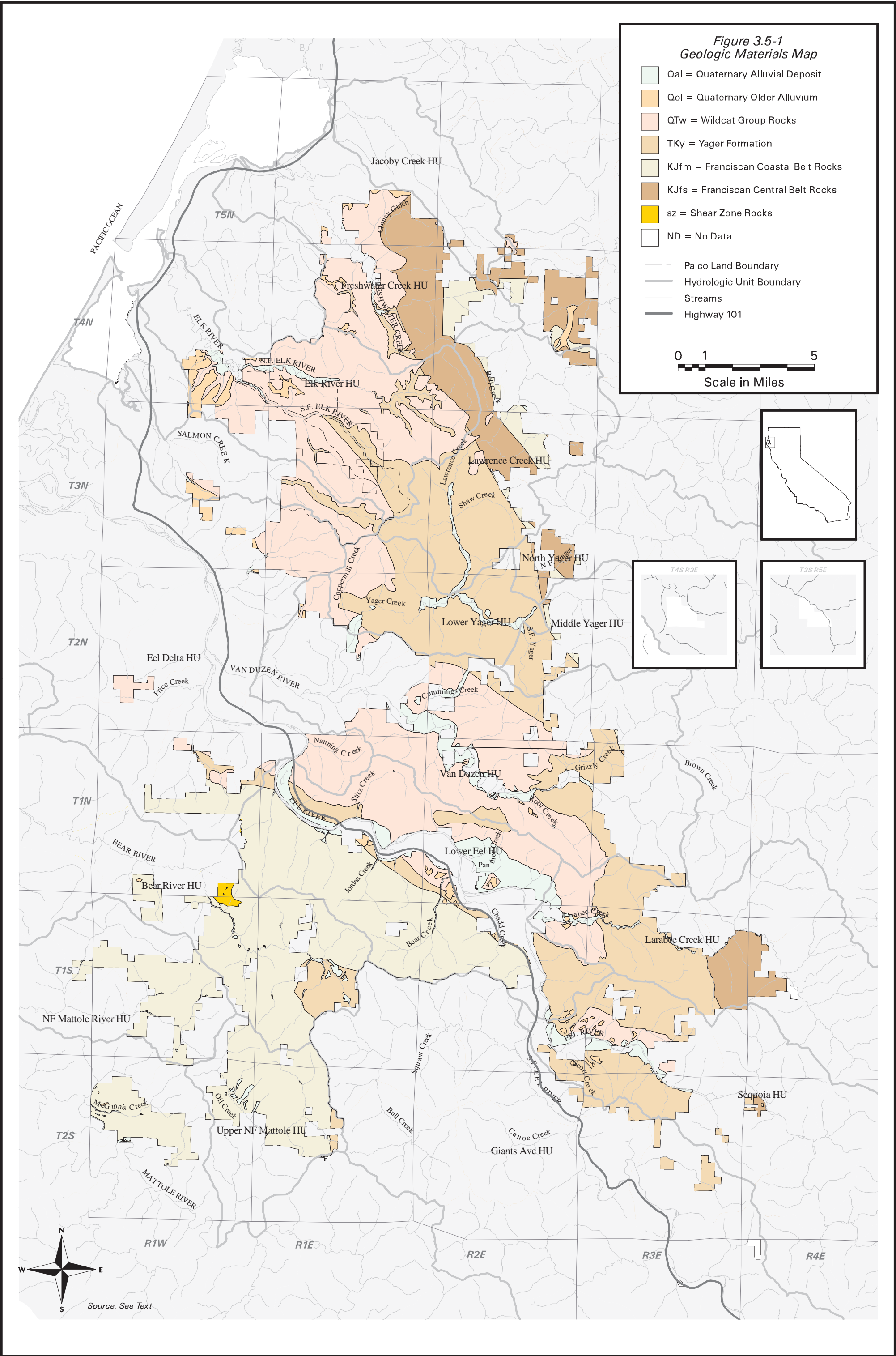
distinctive feature of this area is that it is being compressed in a southwest-northeast direction that is actively folding and faulting the strata to produce the northwest-trending ridges and valleys. A result of this deformation includes the Eel River syncline where active downwarping of the geologic strata is maintaining a depositional basin along the trend of the Eel and Van Duzen rivers north of Carlotta. This small depositional basin contrasts with the overall region around PALCO and adjacent lands, which has experienced several thousand feet of uplift during the past two million years. This uplift continues today. The rate of uplift likely varies substantially across the Project Area (Personal communication, T. Bedrossian, September 1998). South and west of the Eel River, in the Bear River drainage, the terrain is underlain by marine sandstone of the Franciscan Coastal Belt. This area has experienced rapid uplift from the continental shelf and has not been subjected to the degree of compressional deformation experienced north of the Eel River.

The rocks on PALCO and adjacent lands can generally be divided into rocks of the Franciscan complex and younger fine-grained sedimentary rock (Aalto, 1992; Moley, 1992). The Franciscan complex consists of a Central Belt to the east and a coastal belt to the west separated by the Yager fault that trends north northwest to the east of the Eel River. The Central Belt rocks consist of late Mesozoic and early Cenozoic melanges and broken formations which are interbedded. Melanges are large blocks of rocks that have been mixed together, in this case, consisting of blocks of conglomerates, sandstone, chert, limestone, metamorphic, and igneous rock originating in marine environments. These blocks exist in a pervasively sheared matrix of fine-grained mudstone and shale. The broken formations are mostly marine sandstone disrupted by tectonic plate movement. Coastal Franciscan Belt rocks consist mostly of broken marine sandstone

formations without inclusions of exotic blocks of melange. The broken formations are relatively competent and form the higher relief in the Franciscan Central Belt, while the melange commonly fails in large earth flows (Kelsey, 1987). California Division of Mines and Geology (CDMG) staff notes that shallow debris slides and translation/rotational slides can occur in the broken formation (Personal communication, T. Bedrossian, September 1998). The Franciscan Coastal and Central Belts strata represent a portion of the seafloor that was scraped off as the Gorda plate was subducted beneath the North American Plate.

The Franciscan Central and Coastal belts are generally overlain by, or transitions into, the predominantly Paleocene and Eocene age sandstone, conglomerate, and shale of the Yager Formation (see Stratigraphic Columns in Aalto, 1992; Moley, 1992). These folded and faulted rocks are less disrupted than the Franciscan belt rocks and are located along the valley of the Eel River. Franciscan Central Belt strata are being faulted over the Yager Formation along the Yager Fault. The strata of the Yager Formation form relatively high relief topography and exhibit predominately translation/rotational slides and, to a lesser extent, earthflows, similar to the broken formations of the Franciscan terrain.

A younger sequence of sedimentary rocks rests on the Franciscan and Yager strata. Referred to as the Wildcat group, these consist predominantly of marine sandstone, mudstone, and siltstone with minor amounts of river-deposited sandstone (Moley, 1992). The Wildcat Group has several formations, each containing a mixture of rock types with various properties that affect geological stability (Personal communication,



T. Bedrossian, September 1998). These rocks are overlain by recent river sands and gravel deposits of the Hookton and other formations along active rivers. The Wildcat group is located in the northwest trending valleys of the Eel, Van Duzen, and Elk rivers.

The geologic structure of the Project Area is extremely complex due, in part, to its proximity to the MTJ (Clark and Carver, 1992). These three plates are bounded by large fault systems: the Cascadia Subduction Zone that separates the converging Gorda Plate from the North American Plate, the San Andreas Fault that is the boundary between the North American and the Pacific Plate, and the Mendocino Fault that separates Gorda Plate from the Pacific Plate west of the MTJ and extends onshore between Punta Gorda and Cape Mendocino, near the town of Honeydew (Clark, 1992). This tectonic activity resulted in the uplift of the Project Area terrain from several thousand feet below the Pacific Ocean to its current onshore position. Rates of uplift likely vary across the region and Project Area (Personal communication, T. Bedrossian, September 1998), and this can influence slope stability.

North of Petrolea (along the Petrolea Shear Zone-Russ Fault which is the on-land extension of the Mendocino Fault), the area is affected by northeast-southwest compression that resulted in the Pleistocene-Holocene age northwest-trending thrust faults and associated folds. These faults are active, cutting Holocene age (last 10 thousand years) river deposits on PALCO and adjacent lands. Thrusting of Franciscan and Yager strata produces the high relief terrain of the Project Area. The thrust faulting appears to actively transport material from the Jacoby Creek

watershed over its northern drainage divide near PALCO lands (Kelsey, 1987).

Associated with the compression is a series of northwest trending folds oriented parallel to the major river basins and mountain ranges of the exchange area. Synclinal (downward) folding occurs along the trend of the Eel and Van Duzen rivers, the onshore portion of a sedimentary basin (the Humboldt basin) that has been active since the early Pliocene age. These downwarps have created linear zones of deposition which trap a portion of the sediment transported in the Eel and Van Duzen rivers. The sediment erodes from the surrounding uplifted hills. These downwarping areas are an anomaly in a region that is generally being uplifted.

The tectonic activity that uplifted the Coast Range from ocean depths to thousands of feet above sea level during the last several million years has elevated generally incompetent marine ocean shelf sediments to the tops of hills. Rapid erosion of these strata is inevitable due to the nature of the geologic materials and the climate of the region.

Geologic Hazards

Geology-related hazards within PALCO and nearby lands include mass wasting (landslides) and seismic hazards from earthquakes. The predominant mass wasting processes associated with the underlying geological formations are presented here to provide the background for additional discussion in Section 3.6 (Soils and Geomorphology). This information is derived from CDMG maps of the geology and geomorphic features related to landsliding. Table 3.5-1 presents the dominant mass wasting processes associated with the major rock types found within PALCO and adjacent lands.

Table 3.5-1. General Relation of Rock Type to Erosion and Mass Wasting

Formation	Mass Wasting
Franciscan-Melange	Translational/Rotational Slides Earthflows
Central Belt Franciscan-Broken Formation	Translational/Rotational Slides Debris slides
Yager Formation	Debris slides
Coastal Belt Franciscan-Broken Formation	Translational/Rotational Slides Debris slide slope >65 percent
Wildcat Group	Debris slide/Amphitheater-slope Small earthflows Translational/Rotational Slides

Note that the relations displayed in Table 5-1 are general in nature, mass wasting features are not limited to these rock types, and other factors influence the stability of a site. Site-specific susceptibility is not implied, and these relations, while general, should not substitute for site-specific stability assessment during the THP process.

Source: Foster Wheeler Environmental Corporation

Seismic activity around PALCO and adjacent lands has been extensively documented in the scientific literature and in local, statewide, and regional planning documents. Ground shaking from seismic activity can trigger coseismic landslides (CDMG, 1997). In addition to site-specific features such as rock type, slope geometry, and internal geological structure, soil saturation controls the stability (Watters et al., 1996). This suggests that landslide risks increase when the earthquakes coincide with heavy precipitation, storms, and potentially destabilizing landuse activities, such as vegetation removal, road building, and landing construction. While specific information on the occurrence of coseismic landslides does not exist for PALCO and nearby lands, these events are assumed to occur in areas already susceptible to landslides. On PALCO and nearby lands, earthquakes can be associated with interactions of the three tectonic plates discussed above, as well as numerous local faults (Personal communication, Bedrossian, CDMG, September 1998). The converging Gorda-North American intraplate activity accounts for most of the seismic activity recorded from 1974 to 1984 in the Project Area, with earthquakes within the Gorda

Plate accounting for 80 percent of the activity (McPherson, 1992). Clark and Carver (1992) report that the Little Salmon Fault has ruptured three times during the past 1,700 years, producing surface displacements from 11.8 to 14.7 feet (3.6 and 4.5 meters) per event. The recurrence interval for these events is between 300 and 560 years, and the calculated magnitude of these events is at least magnitude 7.6. These events were probably associated with larger seismic events at least magnitude 8.4 and possibly as large as magnitude 9.5 on the southern portion of the Cascadia Subduction Zone.

Mineral Resources

The PALCO and Elk River Timber Company lands are considered in terms of: (1) lands being considered for acquisition; and (2) lands in PALCO ownership covered by the HCP/SYP. A comprehensive assessment of the mineral resources or use in the study area was not undertaken for this environmental review. This review is literature-based and is intended to provide a general description of the mineral resources and known occurrences in the Project Area as they relate to the proposed acquisition of the Headwaters Reserve and

management of PALCO's lands under the HCP/SYP.

Historically, gold mining played an important role in the early economy of Humboldt County (Ogle, 1953). Metallic minerals mined or prospected in the county include copper, chormite, manganese, silver, and zinc (CDMG Minefile Database). Gold mining included both placer and lode, as well as numerous prospects. The CDMG Minefile Database displays a historic manganese mine in the southern portion of the HCP/SYP area and two historic copper mines to the south of the HCP/SYP area. In the study area and nearby, manganese and copper were historically produced from the Franciscan Coastal Belt rocks and possibly from the Yager Formation. Currently, no metallic mineral production occurs in Humboldt County or on PALCO or Elk River Timber Company lands.

Historic mining activity is predominately sand and gravel and rock in the study area and vicinity, and sand and gravel is the main non-fuel mineral resource (Ogle, 1953; Logan, 1947; Strand, 1962; Youngs and Kohler-Antablin, 1966; Department of Conservation, CDMG Minefile Database; and Personal communication, Robert Hill, CDMG September 1998). These sources also identify historic stone production near the study area. This includes rock and some small limestone bodies, especially in the southern portion of the study area. In Humboldt County, there are 23 sand and gravel operations, 11 stone and rock quarries (two for shale), and a borrow pit for fill dirt (CDMG Minefile Database). There are no active sand and gravel mines on the proposed Headwaters Reserve and two in the HCP/SYP planning area.

Sand and gravel deposits occur along the recent channel deposits of the rivers and streams of the Project Area. Additional sand and gravel is found in the Quaternary-Tertiary Wildcat Formation and the Hookton Formation (Ogle, 1953; Strand, 1962). Building stone is currently quarried from the Yager Formation and

historically quarried from the Franciscan Coastal and Central Belt rocks (Ogle, 1953; Strand, 1962). Limestone, presumably from the melange of the Franciscan Central Belt rocks, was historically mined for Portland grade cement.

Hydrocarbon resources (natural gas) exist in the Eel River basin and the on-shore portion of the Humboldt basin, which lies partially on PALCO lands in what is termed the Neogene structural play. The Eel River sedimentary basin has produced gas since 1937 (McLean, 1989).

Hydrocarbons appear to be concentrated in structural traps created by upwardly folded (anticlines) strata resulting from Neogene compression of the North American-Gorda Plate conversion. The Tompkins Hill and Table Mountain anticline structures are gas bearing, with only the Tompkins Hill field producing commercial quantities of gas 2,000 to 5,000 feet deep. The gas comes from the sandstones of the Rio Dell Formation of the Wildcat Group. Cumulative gas production in 1986 was 89.7 billion cubic feet of gas (BCFG). Other gas fields, the Table Bluff and Grizzly Bluff, are subcommercial, although exploration continues.

The mineral resources on PALCO and Elk River Timber Company lands that would be acquired by the United States and the state of California to create the Headwaters Reserve include sand and gravel and reserves of natural gas from the Tompkins Hill gas field. The sand and gravel are used for road construction.

The potential for the occurrence or presence of a mineral resource is distinct from the potential for its development or exploitation. Many factors such as presence, demand, commodity price, access, land use regulations, and other economic issues determine whether a mineral commodity has potential for development.

In general, it appears that there is a relatively low potential for mineral development in the proposed Headwaters

Reserve and in the surrounding HCP/SYP area. Based on the literature cited, the presence, or future development of economically significant metallic mineral reserves cannot be ruled out. Currently, exploited sand, gravel, and stone sources exist in the surrounding area (CDMG Minefile Database). The geological formations that host these deposits are widespread in Humboldt County, but this does not guarantee that the commodities can be mined economically, or will meet demand specifications.

Construction materials such as sand, gravel, and building stone are developed in the area covered by the HCP/SYP. PALCO operates two sand and gravel mining operations in rivers for use in construction and maintenance of logging roads. These gravel mining operations are operated under a permit from the state of California. In addition, PALCO operates two rock quarries under conditional-use permits from Humboldt County in compliance with the California Surface Mining and Reclamation Act (SMARA).

The surface and subsurface mineral rights of the PALCO and Elk River Timber Company lands that would be acquired by the United States and the state of California are being evaluated as part of the realty transaction for their purchase. It is the intent of the United States and the state of California to acquire a unified surface and subsurface mineral estate. Where the title of the subsurface mineral estate is shared among multiple owners, generally descendants of the original title holder, the intent of the government is to acquire a majority ownership sufficient to control surface use.

3.5.2 Environmental Effects

The actions, implementation of the SYP/HCP, and acquisition of lands associated with the four alternatives are evaluated for their direct, indirect, and cumulative effects related to geology and mineral resources.

Thresholds of Significance

The actions associated with the alternatives described in this EIS/EIR are considered significant when they place people or property at risk from major geological hazards such as earthquakes or catastrophic landsliding. Since no structures intended for human occupation are being evaluated in this EIS/EIR, seismic risks are evaluated relative to their potential to cause landslides. Landsliding and mass-wasting effects on soils and water quality are considered in detail in Section 3.6, Soils and Geomorphology. This section evaluates only the contribution of seismic activity to landsliding potential.

3.5.2.2 Direct and Indirect Effects

Geology

For CEQA purposes, actions associated with all alternatives would have an insignificant effect on the geological resources of the area. No activities would occur that would place either people or property at risk from major geological hazards. Timber harvesting, road, and landing construction can increase a site's susceptibility to seismically induced mass wasting (coseismic landsliding), as can any activity that results in conditions that decrease a site's stability. Avoiding the potential for mass wasting depends on the types of procedures implemented during timber harvest design. These procedures vary between each of the alternatives and are considered in detail in Section 3.6. None of the alternatives would have any influence on the likelihood or magnitude of damaging geological events such as earthquakes.

ALTERNATIVE 1 (NO ACTION/NO PROJECT)

Headwaters Reserve

discuss “the existing conditions, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved (14 CCR 15126[d][4]).” CEQA requires neither a projection into the long-term future that could be deemed to be speculative, nor a quantitative analysis of the No Project alternative for comparison with the other alternatives. Accordingly, the state version of the No Action/No Project alternative analyzed contemplates only the short term and is based on individual THPs that would be evaluated case-by-case. The CDF version of No Action/No Project does not attempt to forecast how PALCO's entire property would look in 50 years (the length of the proposed ITP). Since it is unknown how many THPs there would be, where they would lie geographically, and how they would differ in detail, no quantitative analyses of THPs are presented (see Section 2.5.1).

The likely No Action/No Project alternative would consist of PALCO operating in a manner similar to current THP practices and subject to existing CDF authority. In reviewing individual THPs, CDF is required to comply with the FPA, FPRs, and CEQA through its certified functional equivalent program (see Section 1.6.1). The specific criteria for evaluating THPs contained in the FPRs are combined with the case-by-case evaluation of each THP for significant effects on the environment followed by consideration of alternatives and mitigation measures to substantially lessen those effects. Under CEQA and FPRs, CDF must not approve a project with a THP that would cause a significant effect on the environment, and there is a feasible alternative or feasible mitigation measure available to avoid or mitigate the effect. An adverse effect on a listed threatened or endangered species would be a significant effect under CEQA.

Additionally, the present FPRs provide that the Director of CDF shall disapprove a THP as not conforming to the rules if, among other things, it would result in

either a taking or a finding of jeopardy of wildlife species listed as rare, threatened, or endangered by the Fish and Game Commission or a federal fish or wildlife agency or would cause significant, long-term damage to listed species. To make a determination as to the effect of a THP on listed fish or wildlife species, CDF routinely consults with state and notifies federal fish and wildlife agencies. These processes and independent internal review by CDF biologists can result in a THP containing additional site-specific mitigation measures similar to the ones described in the Proposed Action/Proposed Project. CDF believes that its existing process using the FPRs and the CEQA THP-by-THP review and mitigation are sufficient to avoid take of listed species.

The mitigation for which an individual THP is determined to comply with FPRs, the FESA and CESA, and other federal and state laws is determined first by compliance with specific standards in the FPRs and then by development of site-specific mitigation measures in response to significant effects identified in the CEQA functional equivalent environmental analysis of the individual THP. A wide variety of detailed mitigation measures tailored to local conditions is applied with the purpose of avoiding significant environmental effects and take of listed species. These include, but are not limited to, consideration of slope stability, erosion hazard, road and skid trail location, WLPZ width, BMPs on hillslopes and within WLPZs, and wildlife and fish habitat. Consequently, most significant effects of individual THPs can be expected to be mitigated to a level of less than significant through implementation of the No Action/No Project alternative. In some cases, CDF may determine that it is not feasible to mitigate a significant effect of a THP to a level of less than significant. In such a situation, CDF would need to determine whether specific provisions of the FPRs, such as not allowing take of a listed threatened or endangered species,

would prohibit CDF from approving the THP. If approval is not specifically prohibited, CDF would need to weigh a variety of potentially competing public policies in deciding whether to approve the THP. A THP with a significant remaining effect could be approved with a statement of overriding considerations, but such an approval would be expected to be rare.

As noted in Section 2.5.1, under NEPA, the degree of analysis devoted to each alternative in the EIS will be substantially similar to that devoted to the Proposed Action/Proposed Project. The federal agencies recognize that a wide variety of potential strategies could be applied that could represent a No Action/No Project scenario and that they would involve consideration of the same mitigation measures as described above. For the purposes of analysis under NEPA, however, these additional mitigation measures are represented as RMZs, rather than management options developed for site-specific conditions. Consequently, the analysis of the No Action/No Project alternative considers the implementation of wide, no-harvest RMZs as well as restrictions on the harvest of old-growth redwood forest to model conditions over the short and long term. Ranges of RMZ width are considered qualitatively because it is expected that adequate buffer widths could vary as a result of varying conditions on PALCO lands.

Under alternative 1, the existing land ownership would remain as it is, and there would be no Headwaters Reserve. No foreseeable activities could occur in the proposed Reserve that would place either people or property at increased risk from major geological hazards. This alternative would not have any influence on the likelihood or magnitude of damaging geological events such as earthquakes or volcanic eruptions. Although timber harvest, road, and landing construction can increase a site's susceptibility to coseismically induced mass wasting, especially when earthquakes coincide with

winter-saturated soil conditions, such events are unpredictable. A site-specific review to identify unstable slopes would occur during individual THP preparation before harvest.

HCP/SYP Area

Under Alternative 1, neither the HCP nor the SYP would be approved or go into effect. ITPs would not be issued. In addition, CDFG would not approve the HCP as an NCCP and would not approve the 1603 Agreement for certain types of proposed PALCO activities. Activities under Section 1603 would be authorized by CDFG under separate 1603 Agreements as the projects arose and after appropriate CEQA compliance. Similar to the effects in the Headwaters Reserve, no foreseeable activities that would place either people or property at increased risk from major geological hazards could occur in the proposed HCP/SYP area.

ALTERNATIVE 2 (PROPOSED ACTION/PROPOSED PROJECT)

Headwaters Reserve

Under Alternative 2, the Headwaters Reserve would be established from former PALCO and Elk River Timber Company lands. As with Alternative 1, no foreseeable activities that would place either people or property at increased risk from major geological hazards could occur in the proposed Reserve. Unlike Alternative 1, no timber harvest would occur in the proposed Reserve. This would lessen the already very minor chance of influencing coseismic mass wasting.

Alternative 2a would use only PALCO lands and not Elk River Timber Company lands to establish the Headwaters Reserve. Like Alternative 2, no foreseeable activities could occur in the proposed Reserve that would place either people or property at increased risk from major geological hazards. Like Alternative 2, no timber harvest would occur in the proposed Reserve.

HCP/SYP Area

Under Alternatives 2 and 2a, the SYP/HCP would be approved and implemented. Thus, the ITPs would be issued. No foreseeable activities could occur in the proposed HCP/SYP area that would place either people or property at increased risk from major geological hazards. The potential for coseismic landslides exists and could be influenced by forest management. Under the terms of the HCP a detailed mass-wasting assessment as part of the required watershed analysis. Individual THPs would also have a mass-wasting assessment. Details are discussed in Section 3.6, Soils and Geomorphology.

ALTERNATIVE 3

Headwaters Reserve

Under Alternative 3, the Headwaters Reserve would be established with both PALCO and Elk River Timber Company lands. The effects would be the same as for Alternative 2.

HCP/SYP Area

Under Alternative 3, both HCP/SYP would be approved and go into effect. This would allow only selective harvest on PALCO land. Thus, the ITPs would be issued. In addition, if CDFG determined that the HCP and the terms of the 1603 Agreement were adequate, the agency could approve the HCP as an NCCP and approve the 1603 Agreement. The effects would be similar to Alternative 2, with the difference being a possible slight reduction in the potential for mass wasting resulting from maintaining greater root strength because selective harvest leaves some trees. The additional roads and multiple-harvest entries could offset the stability gained from retention of root strength through selective harvest. No foreseeable activities could occur in the proposed HCP/SYP area that would place either people or property at increased risk from major geological hazards. The potential for coseismic landslides exists and could be influenced by forest management. Further site-specific

review to identify unstable slopes would occur during individual THP preparation before harvest.

ALTERNATIVE 4

Headwaters Reserve

Under Alternative 4, the Headwaters Reserve would be expanded to a 63,000-acre no-harvest public reserve. The effects would be the same as for Alternative 2, but would extend over the larger area.

HCP/SYP Area

Under Alternative 4, the portion of PALCO land covered by the HCP/SYP would be reduced compared to Alternative 2. On the resultant lands covered by the HCP/SYP, the effects would be the same as in Alternative 2. No foreseeable activities could occur in the proposed HCP/SYP area that would place either people or property at increased risk from major geological hazards. The potential for coseismic landslides exist and could be influenced by forest management. The HCP/SYP would include a mass-wasting assessment as part of the required watershed analysis.

Mineral Resources

No new mining activity of any kind is part of any alternative. Under Alternatives 2, 3, and 4 the mineral resources of the Headwaters Reserve that would be transferred to the United States and the state of California include salable mineral, sand, and gravel, leasable minerals, and natural gas from the Tompkins Hill gas field. These minerals are not currently being exploited in the Headwaters Reserve area or in the HCP/SYP implementation area. The actual mineral potential would not be different from what it is currently.

Alternatives 2 and 3 would create a 7,503-acre public reserve and Alternative 2a would create a 5,739-acre public reserve on which mineral management activities would be regulated under a reserve management plan. Alternative 4 would create a 63,673-acre public reserve. Because the reserve management would

focus on habitat and species protection, the public use of the reserve would be focused on non-disturbing activities. This would prohibit potential mineral-related activities. In Alternative 1, no public reserve would be created and any future potential mineral exploitation would remain at PALCO's discretion.

The HCP allows for two, four-acre borrow pits to be established in each proposed MMCA for the extraction of soil, gravel, and unconsolidated rock. In this EIS/EIR, the number of MMCAs is considered to be 12 (Figure 2.5-4 and Table 3.9-2). However, these 12 MMCAs are actually in 8 contiguous areas. The proposed HCP (PALCO, 1998) considers there to be eight MMCAs. Consequently, there are potentially up to 16 borrow pits for a potential total of 64 acres of disturbance. Trees up to 12 inches in diameter could be removed to create the borrow pits, effectively limiting their location to what is currently young second growth. Creation and use of these borrow pits would be subject to the SMARA, which has provisions for erosion control and final rehabilitation.

A full title review of the ownership, surface, and subsurface of the Headwaters Reserve is underway and preliminary results indicate that PALCO and Elk River Timber Company retain most of the subsurface mineral estates. There are no known active mineral extraction operations by third parties in the Reserve area. If a unified surface and subsurface cannot be obtained by the United States and the state of California, any potential future development, such as gravel pits, would nevertheless be severely restrained by the BLM Arcata Planning Area Resource Management Plan and by the restrictions associated with the management plan developed for the Headwaters Reserve.

ALTERNATIVE 1

Headwaters Reserve

Under alternative 1, the existing land ownership would remain as it is at present and there would be no Headwaters Reserve. Private land owners would remain able to exploit mineral resources, subject to state and local regulation, on their property. Failure to create the Headwaters Reserve does not change the likelihood of mineral occurrences on the proposed Reserve. While the mineral potential for this area appears low and limited to sand and gravel, without the reserve and its expected management emphasizing non-disturbance, such use is possible and hence greater than if the Reserve existed.

HCP/SYP Area

Under Alternative 1, neither the HCP/SYP would not be approved or go into effect. As with the Headwaters Reserve, PALCO would remain able to exploit their mineral resources, subject to state and local regulation. Neither the approval or disapproval of the HCP/SYP would alter the likelihood of finding economically viable mineral deposits or affect their potential exploitation.

The existing gravel bar mining for road construction materials would continue under existing permit conditions (see Section 3.4 for a discussion of gravel mining on HCP implementation lands). This is also true for existing and future rock quarries and borrow pits that provide material for roads.

ALTERNATIVES 2 (PROPOSED ACTION/PROPOSED PROJECT) AND 2A (NO ELK RIVER PROPERTY)

Headwaters Reserve

Under Alternative 2, the Headwaters Reserve would be established with both PALCO and Elk River Timber Company lands. Creating the Headwaters Reserve would not alter the likelihood of minerals existing on the proposed Reserve, but under this alternative the mineral

development potential would be severely restrained by the Arcata Planning Area Resource Management Plan and by the restrictions associated with the management plans developed for the Headwaters Reserve. Disturbing activities such as mineral development are not anticipated to be allowed.

Alternative 2a would use only PALCO lands and not Elk River Timber Company lands to establish the Headwaters Reserve. Consequently, there would be less area in the proposed Reserve than in Alternative 2. The effect on Elk River Timber Company lands would be the same as in Alternative 1.

HCP/SYP Area

Under Alternatives 2 and 2a, both the HCP/SYP would be approved and go into effect. As with Alternative 1, the approval of the proposed HCP/SYP would not change the likelihood of exploitable minerals existing on PALCO lands. With the exception of gravel mining and quarries for road material, mining activities are not covered in the proposed HCP/SYP. The potential for additional mineral or gas development is very low on PALCO lands. As with Alternative 1, any future non-forestry related mining activities would be subject to state and local regulation and environmental review. In addition, these activities would have to consider endangered and threatened species.

The existing gravel bar mining for road construction materials would continue under existing permit conditions (see Section 3.4 for a discussion of gravel mining on PALCO lands). This is also true for existing and future rock quarries that provide material for roads.

Two, four-acre borrow pits could be located on each of the eight MMCAs in the HCP/SYP area. In all, up to 64 acres of young second growth could be converted to borrow pits. Neither the need nor the locations of these borrow pits have been determined. When needed, the borrow pits

would have to comply with all state and local regulations for surface mining that includes measures to protect wildlife, aquatic resources, and water quality. Because only trees with diameters of less than 12 inches could be removed to develop the borrow pits, the location of the pits would be limited to young second growth. As the management of the MMCAs precludes harvest, it is likely that the borrow pits, if needed, will be developed within the first few years of the HCP implementation period while there are trees with diameters of less than 12 inches.

ALTERNATIVE 3 (PROPERTY-WIDE SELECTIVE HARVEST)

Headwaters Reserve

Under Alternative 3, the Headwaters Reserve would be established with both PALCO and Elk River Timber Company lands. The effects would be the same as Alternative 2.

HCP/SYP Area

Under Alternative 3, only selective harvest would occur on PALCO land. The alternative does not limit gravel or rock quarry mining. The effects would be the same as Alternative 2.

ALTERNATIVE 4 (63,000- ACRE NO-HARVEST PUBLIC RESERVE)

Headwaters Reserve Area

Under Alternative 4, the Headwaters Reserve would be expanded to a 63,000-acre no-harvest public reserve. The effects would be the same as for Alternative 2, except that about 56,000 additional acres would be unavailable for mineral development.

HCP/SYP Area

Under Alternative 4, the portion of PALCO land covered by the HCP/SYP would be reduced by about 56,000 acres compared with Alternative 2. On the resultant lands covered by the HCP/SYP, the effects would be the same as in Alternative 2.

3.5.2.3 Cumulative Effects

Geology

Whether or not the proposed Headwaters Reserve is created, the cumulative effects on geological resources and processes of timber resource harvesting are less than significant for all alternatives for CEQA purposes.

Mineral Resources

HEADWATERS RESERVE AND HCP/SYP AREAS

Based on the low projected growth for Humboldt County (see Section 3.13), it appears that the demand for building material (sand, gravel, and stone) can be met readily by exploitation of prospects outside of the Reserve and HCP/SYP areas.

This is supported by CDMG data that display 23 sand and gravel operations and 11 quarries in Humboldt County. No existing mining operations would be eliminated to create the Reserve, and the HCP/SYP reserves 64 acres of PALCO property for borrow pits to meet PALCO's expected needs. The HCP/SYP would not shift the demand for building material to sources off PALCO property.

Consequently, no significant cumulative effects would occur from creation of the reserves or restrictions on PALCO's lands associated with the proposed HCP.

3.5.3 Mitigation

Because there will be no significant effects, no additional mitigation is recommended.